Phonetically conditioned allomorphy of functional words in a dialect of Southern Italy

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Abstract: This paper examines a particular kind of phonetic variation observed in the realization of articles and clitics in a dialect of Southern Italy. The examined bound morphs consist of single unstressed vowels, which appear to be phonologically underspecified with regard to height. The spectral characteristics of 157 tokens show that these vocalic segments form a continuum ranging from high to mid low vowels, whereas the normal inventory of unstressed vowels in this dialect only contains /i ´ a u/. In order to determine the factors underlying the apparently random allomorphy, the correlations between vowel quality and a number of variables are tested, among which the quality of the preceding and the following vowel, duration, and intensity. The theoretical status of the observed variation as well as a functional explanation of the lowering of unstressed vowels are discussed

PHONETICALLY CONDITIONED ALLOMORPHY OF FUNCTIONAL WORDS IN A DIALECT OF SOUTHERN ITALY

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ABSTRACT

This paper examines a particular kind of phonetic variation observed in the realization of articles and clitics in a dialect of Southern Italy. The examined bound morphs consist of single unstressed vowels, which appear to be phonologically underspecified with regard to height. The spectral characteristics of 157 tokens show that these vocalic segments form a continuum ranging from high to mid low vowels, whereas the normal inventory of unstressed vowels in this dialect only contains /i ´ a u/. In order to determine the factors underlying the apparently random allomorphy, the correlations between vowel quality and a number of variables are tested, among which the quality of the preceding and the following vowel, duration, and intensity. The theoretical status of the observed variation as well as a functional explanation of the lowering of unstressed vowels are discussed.

1. INTRODUCTION

The present contribution deals with a phenomenon of morpho-phonetic variation observed in a corpus of spontaneous speech collected in Sant'Agata de' Goti, in the Southern Italian district of Benevento (Campania). One same kind of variation involves both definite articles and direct-object clitic pronouns (as well as other functional words such as prepositions and conjunctions, which will not be taken into account in the present study). In this dialect, articles and clitics of the same gender and number are systematically homonymic and consist of a single unstressed vowel. On the other hand, each couple of article and clitic of the same gender and number presents an apparently random allomorphy, along a wide range of variation reaching from low mid to high vowels: respectively, [O ~ o ~ u] for the masculine singular and the neuter, and [E ~ e ~ i] for the feminine and masculine plurals.[1] Only the feminine singular articles/clitics lack such allomorphy, being always realized as [a].

The aims of our research are as follows: a) to describe the distribution of these morphs and to verify whether they group around the dispersion areas of average Italian unstressed [o, u] and [e, i] or if they rather form two continua in the areas of back and front vowels, respectively; b) to determine if phonotactic and/or prosodic factors favor the choice of the different allomorphs. Among the possible factors we will focus, in this first step of our research, on the preceding and following vowels (vowel harmony) as well as on the duration and intensity of the examined segments.

2. METHODS

The materials used for this study belong to a larger corpus of 36 free interviews gathered in six small towns from the above mentioned area. For the purpose of the present study, we chose three speakers native and resident of the same town: two men (A, G) and one woman (F), from whose spontaneous speech we isolated a total of 157 vowels. The selected tokens include 111 articles and 46 clitics, which in their turn can be classified as follows: 78 masculine and neuter singulars realized as back vowels [O ~ o ~ u] and 79 masculine and feminine plurals realized as front vowels [E ~ e ~ i]. Henceforth, we will not distinguish between articles and clitics, given their overall homonymy. We also found it proper not to classify the tokens prior to analysis, as far as their opening degree is concerned, limiting ourselves to indicate their place of articulation in terms of a front vs. back opposition.

The 157 tokens were analyzed at the *Phonetisches Laboratorium der Universität Zürich* by means of a Sona-Graph Kay 5500. For each item, the following parameters were measured: segment duration, maximum intensity, F1 and F2 of the average spectrum of the whole segment.[2] For the male speakers a filter of 234 Hz was employed, whereas for the female speaker it revealed itself necessary to make use of a wider filter of 400 Hz.

In order to verify the possible influence of the phonotactic context on the spectra of the observed items (for example, in terms of vowel harmony effects), we also labeled the preceding and the following vowel phonemes.

3. RESULTS

3.1. Formant frequencies

The formant values measured (in Hertz) for the 157 analyzed segments are shown in Figure 1, where the F1 values are plotted on the Y-axis, and the F2 values on the X-axis:[3]

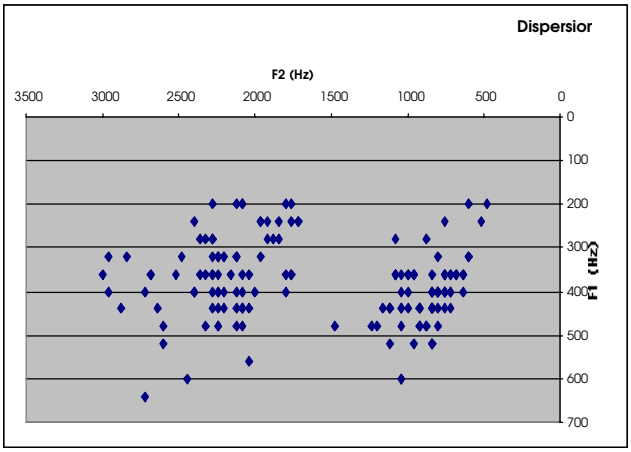

Figure 1. F1/F2 plot of the measured vowels.

The figure bears evidence confirming our hypothesis about the existence of a broad continuum of realizations, ranging for both back and front vowels from the high to the mid low tongue position, without any apparent grouping around one or more particular points in the vowel space. As to back vowels, their F1 values range from a minimum of 200 Hz to a maximum of 600 Hz (average value = 406 Hz; standard deviation = 76 Hz), whereas the F2 values lie between 480 Hz and 1480 Hz (average = 877 Hz; standard deviation = 178 Hz). The F1 values for front vowels range from 200 Hz to 640 Hz (average = 358 Hz; standard deviation = 95 Hz); their F2 frequencies go from 1720 Hz up to 3000 Hz (average = 2222 Hz; standard deviation 306 Hz).

Although the width of the observed range of variation can partly be explained - in particular as far as F2 is concerned - by the presence of speakers of both sexes among the informants, it still remains notable that the dispersion shown in Figure 1 covers the whole range of the stressed non low vowels of standard Italian, whose average formant values are listed in Table 1 (from Albano Leoni and Maturi [1]):

	F1	F2
u	305 ± 55	861 ± 135
o	409 ± 58	1001 ± 257
O	554 ± 65	1055 ± 191
E	500 ± 77	1844 ± 181
e	375 ± 63	2028 ± 195
i	275 ± 61	2240 ± 160

Table 1. Average formant frequencies of stressed standard Italian vowels.

3.2. Conditioning factors

In the present section, we will examine the degree of correlation between the spectral pattern of articles and clitics on the one hand and their phonotactic context (3.2.1.), duration (3.2.2.) and intensity (3.2.3.) on the other.

3.2.1. Phonotactic context. As to the observation of coarticulation effects on the segmental features of the examined items, we limit ourselves – at the present stage of our research – to studying how the surrounding vowels affect F1 and F2 of the back and front vowels in the morphs.

Figures 2 and 3 display F1 and F2 average values for back vowels in relation to the quality of, respectively, the preceding and the following vocalic segments (or to the presence of a prosodic boundary, i.e. pause). In the histogram of Figure 2, the relation between the opening of the preceding vowel and the F2 of the examined segments is immediately evident through the regular rise and decline of the columns from left to right; the same tendency – though with a lesser regularity – seems true for F1. For example, after [a] F1 has an average of 450 ± 62 Hz and F2 has an average of 993 ± 177 Hz, while after [i] the formant frequencies fall to 380 ± 48 Hz for F1 and 840 ± 142 Hz for F2, and after [u] to 394 ± 131 Hz for F1 and 783 ± 138 Hz for F2. In other words, the more open the preceding vowel, the more open and central the realizations of the affected articles and clitics.

Conversely, no relevant correlation results from the data in Figure 3, which witness for the absence of any regular anticipatory coarticulation effects on back vowels.

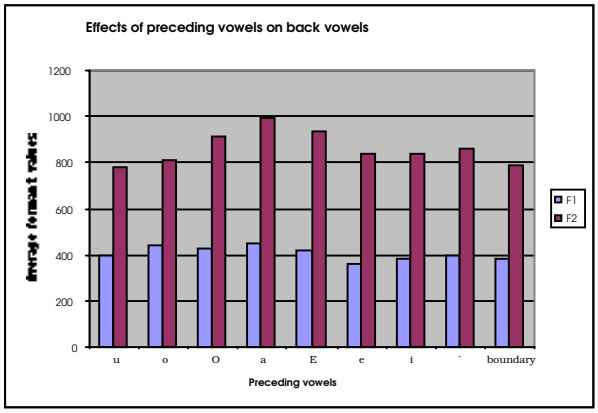

Figure 2. Effects of preceding vowels on back vowels.

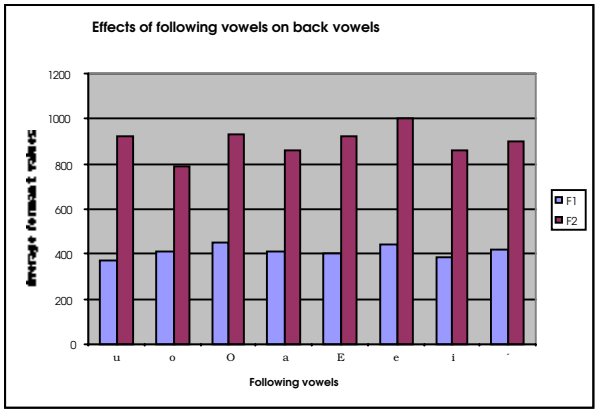

Figure 3. Effects of following vowels on back vowels.

Figures 4 and 5, on the other hand, contain the formant frequencies for front vowels in the same phonotactic conditions.

In Figure 4, again, the evident regular fall and rise – from left to right - of the F2 columns as well as a less evident variation in the F1 values confirm the presence of a carry-over coarticulation effect.

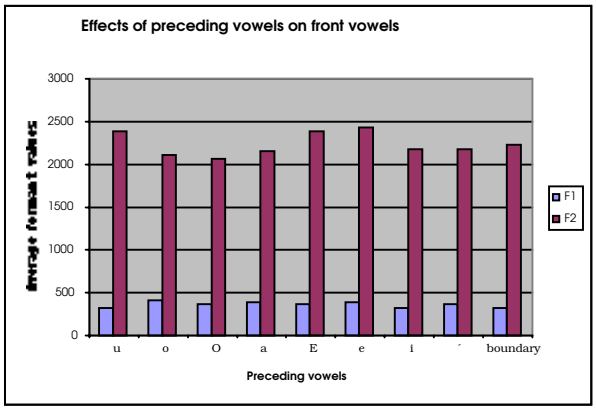

Figure 4. Effects of preceding vowels on front vowels.

Here, the closest realizations are observed after [u] (320 ± 89 Hz) and after [i] (329 ± 84 Hz), while the most open ones – quite curiously – appear after [o] (420 ± 28 Hz). As to F2, it ranges, less regularly, from a minimum of 2216 ± 227 Hz after [ɔ] to a maximum of 2440 ± 396 Hz after [e].

Figure 5, finally, seems to exclude – similarly to the case of back vowels – any regular influence of the following vocalic context on front vowels.

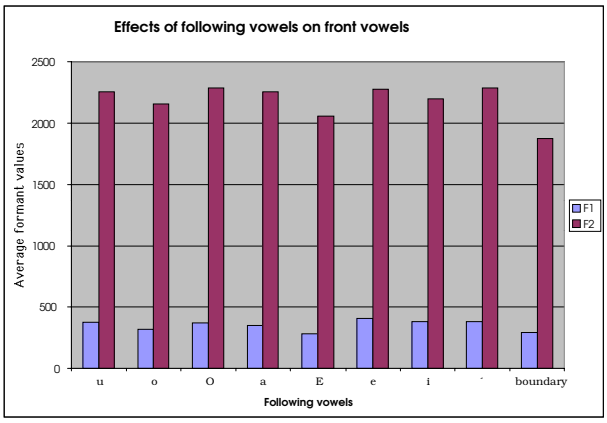

Figure 5. Effects of following vowels on front vowels.

3.2.2. Duration. The average duration of the measured segments amounts to 84 milliseconds, with a standard deviation equal to 55. If we consider that, in spontaneous speech, an unstressed Italian vowel usually has a duration of 40-80 milliseconds, while a stressed one lasts 80-150 milliseconds ([1]), it follows that the items here observed display a somehow intermediate behavior between these two classes.

As to the relation between duration and segmental characteristics, we found that, when applied to the whole sample, correlation tests produced negative answers, thus suggesting an unexpected lack of dependence of the vowel spectrum from this particular prosodic feature ($r = .102$, $p > .2$ with F1; $r = .107$, $p > .01$ with F2). Only after splitting the sample, according to the place of articulation, did some correlation obtain between duration and F2 of the back vowels ($r = -.297$, $p > .007$). In other words, a longer duration increases the backward articulation of the vowels, whereas a shorter duration may lead to centralization.

Even more surprisingly, by the way, no correlation emerged between duration and intensity, either ($r = -.109$, $p > .1$).

3.2.3. Intensity. The average intensity of the measured vowels is equal to –25.3 dB,[3] with a standard deviation of 8.1. In this case, unlike with duration, most correlation tests yielded positive results. With the whole sample, both F1 and F2 are correlated with duration: for F1 we obtained an $r = .255$ ($p > .001$), while for F2 $r = .214$ ($p > .006$). When restricting the test to the back vowels only, correlations obtain even better, both yielding the same $r = .325$ ($p > .003$). Front vowels also show a significant correlation as far as F1 is concerned ($r = .336$, $p > .001$), no correlation at all emerging between duration and F2 for front vowels ($r = -.079$, $p > .4$). Thus, an increase in intensity corresponds to a lowering of the realizations of both back and front vowels.

4. DISCUSSION

The dispersion of the vowel spectra in the F1/F2 plane (Figure 1) confirms the hypothesis of a very wide range of variation, falling into a continuum rather than corresponding to two or more discrete sound classes. The only common specification of the morphemes dealt with rests on the distinctive feature [±back], whereas their segmental content remains phonologically underspecified for the feature [±high].

Nevertheless, the variation did not prove to be completely unconditioned, since it is affected - to a greater or lesser extent – by different phonetic mechanisms. In particular, we found some carry-over effects from the preceding vowels on both F1 and F2 frequencies, while the following vowels came out not to have any significant influence. A minor role is played by duration, in that it only affects the F2 values of back vowels. Instead, the correlation between intensity and vowel openness appears to be quite evident for both back and front vowels, suggesting that intensity be the most important conditioning factor among the ones here examined.

Two issues remain to be discussed: the possible functional explanation of the lowering of the unstressed vowels, and the descriptive status of the observed variation with regard to the overall structure of the linguistic system.

The dialects of Campania present a regular rise of low mid and high mid vowels to high vowels in unstressed syllable, which seemingly affects only partially and not automatically bound morphs like articles and clitics. Such functional words, though unstressed in the speech chain, are relevant to the syntactic structure of the sentence and therefore resist, at least to some extent, the process of weakening imposed to other unstressed vowels. Probably, also the intermediate average length of these segments can be interpreted as the result of two competing forces: on the one hand, their morphological status of

functional words, on the other hand, their phonetic status of unstressed vowels.

As to the theoretical implications of the results, we might conceive of the variation in terms of a non discrete allomorphy which is phonetically, yet not phonologically determined. This interpretation would suggest the interesting case of a phonetics-morphology interface, since the described allomorphy depends on performance conditions rather than on the linguistic structure.

An possible alternative interpretation of the observed facts would state that there be no allomorphy at all, since morphonological rules usually meet precise phonological input conditions and lead to a fully specified output in terms of distinctive features. Should we accept the idea that a morpheme consisting of a single vowel can be defined just as [+back] or as [-back] (in a variety with four heights in back and front), then the different realizations could be described in terms of allophones, rather than allomorphs, with the whole range of variation falling within the scope of phonetics.

NOTES

1. It should be remembered that Campanian dialects share the seven-vowel system of standard Italian in stressed position, consisting of the following phonemes: /i e E a O o u/. In unstressed position, on the contrary, while Italian - due to the neutralization of the opposition between low mid and high mid vowels - has a five-vowel system /i e a o u/, Campanian dialects show a smaller vowel inventory, only including /i ´ a u/.
2. We felt obliged to abandon the idea of measuring the average spectra of the mid portion of the vowel segments, which in some cases would have reduced the portion thus measured to only one or two periods. It should be kept in mind that we are dealing with unstressed vowels, naturally shorter than stressed ones, which were uttered in spontaneous, most often very fast speech.
3. The scales appear inverted in order to obtain a visual correspondence between the representation of the acoustic data and the vocal tract geometry.
4. The measures for intensity all show a negative value relative to an arbitrary maximum fixed by the Sona-Graph itself.

REFERENCES

[1] Albano Leoni, F., Maturi, P. 1995. *Manuale di fonetica*. Roma, La Nuova Italia Scientifica